

# Dorsal onlay vaginal graft urethroplasty for female urethral stricture

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## ABSTRACT

**Introduction:** Female urethral stricture is an underdiagnosed and overlooked cause of female bladder outlet obstruction. The possible etiologies may be infection, prior dilation, difficult catheterization with subsequent fibrosis, urethral surgery, trauma, or idiopathic. We present our technique and results of dorsal onlay full thickness vaginal graft urethroplasty for female urethral stricture.

**Materials and Methods:** A retrospective review was performed on 16 female patients with mid-urethral stricture who underwent dorsal onlay vaginal graft urethroplasty from January 2007 to June 2011. Of these, 13 patients had previously undergone multiple Hegar dilatations, three had previous internal urethrotomies. The preoperative work up included detailed voiding history, local examination, uroflowmetry, calibration, and micturating cystourethrogram.

**Results:** All patients had mid-urethral stricture. Mean age was 47.5 years. Mean  $Q_{max}$  improved from 6.2 to 27.6 ml/s. Mean residual volume decreased from 160 to 20 ml. Mean duration of follow-up was 24.5 months (6 months to 3 years). Only one patient required self-calibration for 6 months after which her stricture stabilized. None of the patient was incontinent.

**Conclusion:** Dorsal vaginal onlay graft urethroplasty could be considered as an effective way to treat female urethral stricture.

**Key words:** Dorsal onlay, female urethral stricture, vaginal graft

## INTRODUCTION

Female urethral stricture is an usually underdiagnosed condition. It occurs in 2.7% to 8% of females presenting with lower urinary tract symptoms and surgical treatment is still debatable.<sup>[1]</sup> Any strict diagnostic criteria has not been documented for female urethral stricture because of its rare incidence. However, Defreitas *et al.* stated that a detrusor pressure (Pdet) of 25 cm of H<sub>2</sub>O and maximum urinary flow rate ( $Q_{max}$ ) of less than 12 ml/s is consistent with obstruction.<sup>[2]</sup> The most common aetiology for female urethral stricture

may be infection, repeated instrumentation, trauma, previous surgeries for incontinence or diverticula, radiation for pelvic malignancy, and idiopathic. As similar to the male urethral stricture disease, results of repeated urethral dilatation and internal urethrotomy are not good in females also as subsequent fibrosis occurs due to bleeding and extravasation.<sup>[3]</sup> Surgery is often the answer in such cases in the form of meatoplasty for distal urethral strictures and grafts or flaps for mid- and proximal-urethral stricture. Several methods of female urethroplasty have been reported in various small series.

We hereby present our single centre experience of treating female urethral stricture with dorsal onlay vaginal graft in 16 patients.

## MATERIALS AND METHODS

A retrospective review was performed on 16 female patients with mid-urethral stricture who underwent dorsal onlay vaginal graft urethroplasty from January 2007 to June 2011. Full informed consent was taken from all the patients. The diagnostic criteria taken were: A maximum urinary flow rate of less than 10 ml/s, inability to calibrate urethra with 10 Fr catheter, and narrowing of urethra with proximal dilatation on micturating cystourethrogram [Figure 1]. All patients had

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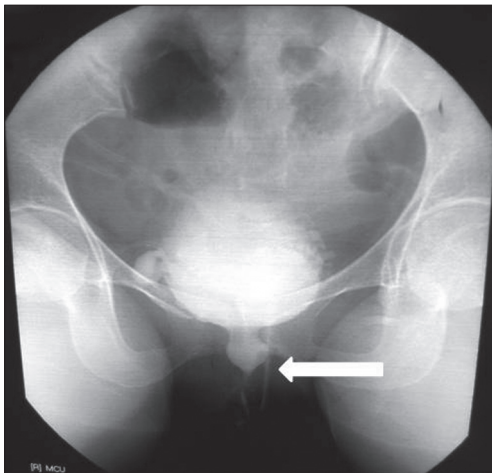
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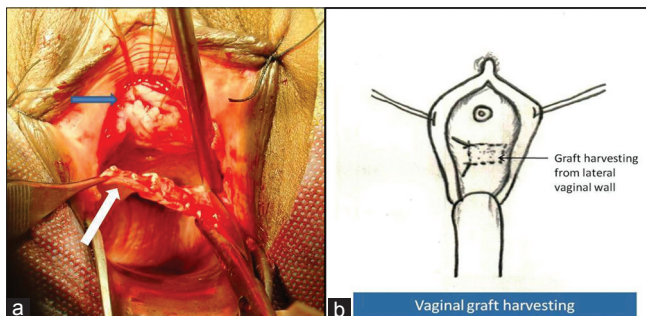
preoperative evaluation including detailed history, physical examination, uroflowmetry, residual volume, and micturating cystourethrogram. Calibration was not attempted with 16 or 18 Fr catheter as it could dilate some soft strictures and make interpretation of micturating cystourethrogram difficult. Almost all 16 patients presented with poor flow and feeling of incomplete voiding, two of them had recurrent urinary tract infections and two had frequency and urgency as their main presenting complaints. Thirteen out of 16 patients had previously undergone multiple Hegar dilatation, three had previous internal urethrotomies for bladder outlet obstruction. The stricture etiology was idiopathic in 13 cases, one had undergone multiple transurethral resections for a bladder tumor, one had history of diverticulectomy, and one had traumatic urethral stone extraction [Table 1]. None of the patients had preoperative incontinence or any grade of prolapse. All patients had normal preoperative serum creatinine. Preoperatively patients were advised to keep clindamycin and clotrimazole vaginal pessaries for at least 2 days to prepare vagina for graft harvesting.

The procedure requires the patient to be placed in the dorsal lithotomy position. The operative field, including the vagina, is cleaned and draped with strict aseptic measures. The anus is adequately covered and sealed

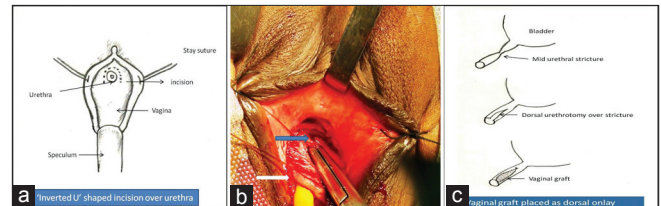
from the operative area. Cystoscopy is done with 6 Fr pediatric cystoscope to see the stricture area and assess its length from bladder neck. Normal saline mixed with 1% adrenaline is injected in periurethral tissues and urethra is dissected dorsally and laterally from 3 to 9' 0 clock position by an inverted U-shaped incision [Figure 2a]. Stay sutures are taken at urethral angles to help in dissection. Sharp dissection is done with scissors. Dissection is done with care so as not to damage the bulbs and the clitoral body by staying close to the fibrous tissue of the urethra. An 18 Fr Foley is inserted upto the stricture segment and urethra is dissected proximally above the stricture in retropubic space [Figure 2b]. A full-thickness urethrotomy is then made over the stricture site at 12' 0 clock position with a surgical blade and then extended with scissors upto proximal and distal healthy area which may extend even upto urethral meatus [Figure 2c]. Urethra is now again calibrated with an 18 Fr Foley catheter to ascertain that there is no proximal stenosis beyond the incised strictured site. Saline is injected in submucosal plane in lateral vaginal wall and full-thickness vaginal graft is harvested and defatted [Figure 3a and b]. The dimensions of the harvested graft are in accordance with the length of the stricture plus additional healthy margin. Then an 18 Fr silastic catheter is placed in urethra over which vaginal graft has to be sutured to urethrotomy site. The vaginal graft is then sutured on the dorsal surface of urethra as onlay graft with 4-0 PDS sutures in interrupted fashion [Figure 4]. First



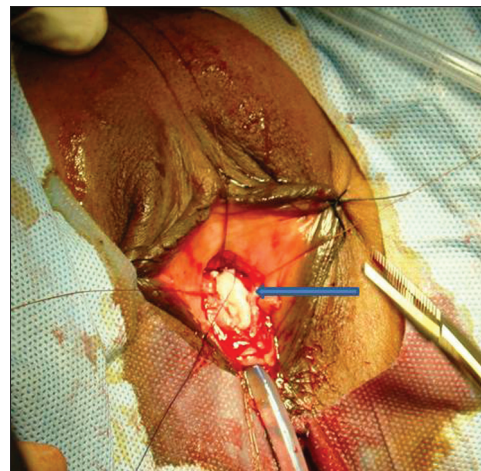
**Figure 1:** Micturating cystourethrogram showing urethral stricture with proximal dilatation (white arrow)



**Figure 3:** (a) Vaginal graft harvesting shown by white arrow and urethral meatus by (blue arrow) (b) Line diagram showing vaginal graft harvesting



**Figure 2:** (a) Line diagram showing inverted U-shaped incision over urethra (b) Development of retropubic space (blue arrow) on the dorsal aspect of urethra with stay sutures at urethral angles (white arrow) (c) Line diagram showing mid-urethral stricture, dorsal urethrotomy, and dorsal vaginal graft placement



**Figure 4:** Vaginal graft sutured as dorsal onlay (blue arrow) over urethrotomy site

suture is taken at the apex of urethra and then onto the graft and tied. Then suturing of right and left margin of urethra is done with vaginal graft and urethra is sutured back to its normal position with 4-0 PDS suture [Figure 5]. Distally the vaginal mucosa may be tailored and split to achieve a



**Figure 5:** Final post operative appearance after suturing urethra back to its normal position

normal meatal slit-like appearance if urethrotomy has been extended to external meatus.

Mean hospital stay was 2.5 days (2-7 days). After 14 days patient is again called for voiding cystourethrography and catheter removal.

Our follow-up protocol includes every 3 monthly assessment of voiding and storage lower urinary tract symptoms, uroflowmetry, and one weekly self-calibration. Patient is followed-up for a minimum of 2 years after which she may be shifted to a less rigorous 6 monthly or an yearly follow-up.

## RESULTS

Site of stricture was mid urethra in all 16 patients. Mean age of patients was 47.5 years (38-58 years). Mean preoperative versus postoperative  $Q_{max}$  was 6.2 ml/s versus 27.6 ml/s, mean residual urine was 160 ml versus 20 ml. Mean stricture length was 1.1 cm (1 cm-2.1 cm). Mean operative time was 82 minutes → Mean duration of follow-up was 24.5 months (6 months-3 yrs). None of the patients

**Table 1: Patient Characteristics**

Pt. no	Age (yrs)	Etiology	Previous treatments	Presenting symptoms	Preop incontinence	$Q_{max}$ (ml/sec)	PVR (cc)
1	38	Idiopathic	Dilatation	Poor flow, incomplete voiding	No	5.2	150
2	42	Mid urethral sling surgery	Dilatation	Poor flow, incomplete voiding	No	7.8	200
3	45	Idiopathic	Urethrotomy	Poor flow, incomplete voiding	No	4.7	140
4	52	Idiopathic	Dilatation	Poor flow, incomplete voiding	No	5.5	175
5	51	Idiopathic	Dilatation	Poor flow, incomplete voiding	No	8	200
6	44	Idiopathic	Dilatation	Frequeny, urgency	No	7.5	140
7	52	Idiopathic	Dilatation	Poor flow, incomplete voiding	No	4.5	250
8	38	Diverticulectomy	Dilatation	Poor flow, incomplete voiding	No	9.8	140
9	50	Idiopathic	Dilatation	Poor flow, incomplete voiding	No	7.8	120
10	47	Idiopathic	Dilatation	Recurrent Urinary Tract Infection	No	6.4	130
11	46	Idiopathic	Urethrotomy	Poor flow, incomplete voiding	No	4.8	125
12	50	Multiple Transurethral Resection Of Bladder Tumor	Dilatation	Poor flow, incomplete voiding	No	6.2	150
13	58	Idiopathic	Dilatation	Frequency, urgency	No	6.5	200
14	53	Idiopathic	Dilatation	Poor flow, incomplete voiding	No	5.5	190
15	44	Idiopathic	Dilatation	Recurrent UTI	No	3.5	120
16	50	Idiopathic	Urethrotomy	Poor flow, incomplete voiding	No	7.5	130



had evidence of any vaginal bleeding or graft necrosis in form of either discolouration or sloughing of vaginal graft. Patients did not report any significant postoperative pain or discharge suggestive of wound infection and were advised to return to their normal daily activities after 3 to 4 days. At first follow-up 3 weeks after surgery, micturating cystourethrogram showed a normal urethra without any proximal dilatation. The criteria of successful reconstruction was a postoperative  $Q_{\max}$  greater than 15 ml/sec with minimal post void residue (<30 ml) and normal appearing voiding cystourethrogram. One weekly self-calibration is advised for initial 3 months.

At 1 year of follow-up, all patients had  $Q_{\max} > 15$  ml/sec without any significant residual urine or voiding and storage lower urinary tract symptoms, except one patient who had poor flow ( $Q_{\max} = 9$  ml/sec) and feeling of incomplete voiding with high residual urine (200 ml). A flexible cystoscopy was done which showed soft stricture just proximal to graft area, which was dilated with Hegar dilator. She was kept on self-calibration on a twice weekly schedule and her stricture was stabilized after 6 months. At mean follow-up of 24.5 months, all patients voided well with good flow. None of the patients reported incontinence during follow-up based on patient physician interview.

## DISCUSSION

Female urethral stricture is usually an underdiagnosed condition.<sup>[1]</sup> It was treated in past with repeated urethral dilatations and internal urethrotomies. As in males, urethral stricture disease in females can cause voiding and storage lower urinary tract symptoms, recurrent urinary tract infections, and even renal impairment. These symptoms are usually of long duration and severe which cause significant impairment in quality of life. Stricture is usually distal to external urethral sphincter and can occur in any part of urethra, although it seems to occur most commonly in mid and distal urethra and less in proximal urethra.<sup>[3]</sup>

Often these females are referred by physicians and surgeons as there is no means by which they can be relieved medically. These patients may be evaluated by detailed voiding history including symptoms of stress and urge incontinence and recurrent urinary tract infections. Local examination should be done along with uroflometry and measurement of residual volume. Calibration may be done gently with 10 Fr catheter for diagnosis as a wider bore catheter could dilate some soft stricture and then micturating cystourethrogram would not show narrowing of stricture site and proximal urethral dilatation.

Surgical treatment of female urethral stricture disease has not been adequately addressed in literature and few small series describing various techniques of female urethroplasty are available.

Smith, *et al.* reported their experience with dilatation and intermittent catheterization in seven female urethra stricture patients with seemingly good results, as amongst patients declared cure, none required more than four dilatations.<sup>[3]</sup> However, he stated that for patients who are not compliant or cannot self-catheterize, this procedure is inadequate and urethroplasty could be a better option.

The dorsal approach for vaginal graft has the same advantages as described in that of male stricture urethra of strong mechanical support and vascular bed provided by clitoral: Cavernosal tissue, decreasing the risk of diverticula formations. It is a more physiological reconstruction that directs the urinary stream away from vagina and spares the ventral aspect of urethra for further anti-incontinence surgery.<sup>[4]</sup>

Montorsi *et al.* described vestibular flap urethroplasty in 17 patients.<sup>[5]</sup> Under optical magnification, an inverted Y-shaped incision was made around the meatus and the distal part of the urethra was dissected from its perimeatal tissue from the 9 o'clock to the 3 o'clock position. The urethra was then incised "dorsally" (close to the vagina) and a vestibular flap was developed superior to the urethra. However this procedure could not be used in cases of vaginal fibrosis. Tanello *et al.* reported the use of a pedicle flap from the labia minora for the repair of female urethral strictures in two patients.<sup>[6]</sup> Berglund *et al.* presented the technique of ventral onlay buccal mucosal graft urethroplasty for recurrent urethral stricture disease 30 months of follow-up.<sup>[7]</sup> After surgery one of the two patients developed a recurrence of LUTS because of meatal stenosis. Swender *et al.* used the technique of anterior vaginal mucosal flap in eight patients with complete cure in seven patients after a single procedure who previously underwent multiple dilatations.<sup>[8]</sup> Simonato *et al.* presented a series of six patients who underwent vaginal inlay flap urethroplasty inspired by Orandi technique with good results.<sup>[9]</sup>

To summarize the advantages, the procedure that we have described is inherently simpler to perform since it does not require tissue tunneling or flap rotation. There is also little distortion of the vagina and perivaginal tissues. It provides a more physiological voiding with urinary stream directed away from vagina and spares ventral urethra for further anti-incontinence procedures. We did not observe any *de novo* incontinence in any patient during follow-up. Whole of the procedure can be completed in spinal anaesthesia and does not require nasotracheal intubation and general anaesthesia which are required in patients in whom buccal and lingual mucosa are used as a graft.<sup>[10]</sup> It would be worthwhile mentioning that we were not very stringent in documenting radiographs and endoscopic pictures of this rare entity which would certainly be of much interest for readers.

This procedure of dorsal onlay vaginal graft seems to be an effective way to treat female urethral stricture. It may be done in cases of mid- and proximal-urethral stricture. It seems that the operative concept of the dorsal vaginal onlay graft could be tested in a larger series with a long-term follow-up, and compared with other urethroplasty techniques to further evaluate benefits and pitfalls.

## CONCLUSION

Dorsal onlay vaginal graft urethroplasty for mid- and proximal-urethral stricture is a simple and effective technique which can avoid repeated painful dilatations and multiple urethrotomies in females. Further studies with more patients and long follow-up are required to endorse the success of this procedure.

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